Orbital Complications

Epidemiology

The most frequent serious complication from sinusitis is infection spreading to the orbit, accounting for approximately 80–90% of cases of complicated sinusitis [23, 25]. This is predominantly a disease of childhood, with a peak incidence between the ages of 5 and 10 years [12]. In one recent analysis, nearly 80% of patients with orbital infections from sinusitis were less than 18 years old [37]. As a result, sinus infections are the most common cause of unilateral proptosis in children and the third most common cause in adults following Graves’ orbitopathy and pseudotumor [24, 37].

Etiology

Most orbital infections secondary to sinusitis are the result of ethmoid disease [37]. This is due in part to the close proximity of the ethmoid sinus to the orbital cavity. In addition, the two are separated by the thin lamina papyracea of the ethmoid bone which frequently has congenital or traumatic dehiscences within it. Furthermore, erosion of the lamina may occur as a result of the infection or inflammatory sinus disease such as polyposis or allergic fungal sinusitis. Alternative routes of infectious spread include the anterior and posterior ethmoidal neurovascular foramina [24] and the venous system. The ophthalmic venous system, made up of the superior and inferior ophthalmic veins, is valveless, allowing for free-flowing communication of infection from the nose and ethmoid sinus to the orbit.

Clinical Presentation

Patients with an orbital infection from sinusitis normally present with gross swelling of the orbit (Fig. 24.1). The initial manifestation of lid edema may progress rapidly to cause chemosis and visual changes such as diplopia. Orbital infections may be characterized by their location in relation to the orbital septum, with more severe disease located in the postseptal compart-
Presentation and examination can help differentiate the location of the infection, as proptosis and ophthalmoplegia are found in a significantly higher number of patients with postseptal disease [30].

Perhaps the most studied infection of the orbit related to sinusitis is subperiosteal abscess. This infection is characterized by a purulent collection between the lamina papyracea and orbital periosteum and most commonly presents as erythema and edema of the eye [1]. The majority of patients with a subperiosteal infection also have chemosis, limitation of extraorbital motion, proptosis, and pain with eye movement [1]. As the infection continues to spread to become an intraorbital abscess, visual changes will continue to evolve. Eventually, visual compromise can occur from several proposed mechanisms: increase in intraocular pressure and pressure ischemia, traction on the optic nerve secondary to proptosis, optic neuritis as a reaction to the infection, or ischemia from thrombophlebitis [1, 27]. If the infection is not adequately treated, symptoms may continue to progress to lethargy, headache, fever, and confusion, as the infection continues to spreads to the cavernous sinus.

**Evaluation**

The evaluation of a patient with a presumed orbital complication of sinusitis consists of orbital and sinus computed tomography (CT) scans to help characterize the extent of disease in the orbit and the origin of infection in the paranasal sinuses. If orbital swelling is minor and no visual changes or restriction of gaze exist, it can be presumed that the infection is preseptal and treatment can often be initiated without imaging. However, if a brief trial of medical treatment has failed, or signs and symptoms are consistent with a postseptal infection, then imaging becomes necessary.

It is recommended that imaging be performed with the addition of intravenous contrast to better demarcate abscess formation. A non-contrast CT or gadolinium-enhanced magnetic resonance imaging (MRI) scan may be performed in patients with sensitivities to iodine-based contrast. Initially obtaining the scan with an image-guided protocol may minimize the need for a second scan if operative intervention becomes necessary. In addition to imaging, standard blood tests should be obtained including a white blood cell count and blood cultures.

Ophthalmology should be consulted early to help evaluate the condition of the orbit as well as to provide a baseline examination to help determine response to treatment. Ophthalmology examination should consist of tests of visual acuity, ocular range of motion, pupillary reactivity, and a funduscopic evaluation for papilledema and pallor of the optic disc [27, 37].

**Staging**

The extent of spread of sinusitis to the orbit is most commonly grouped into five different areas increasing in severity. The most accepted scheme was first proposed by Hubers, was modified by Chandler in the 1970s [7], and is as follows:

- **Group I:** Inflammatory edema (preseptal cellulitis)
- **Group II:** Orbital cellulitis
- **Group III:** Subperiosteal abscess
- **Group IV:** Orbital abscess
- **Group V:** Cavernous sinus thrombosis.

The classification system is helpful as it demonstrates the potential progression of disease. Patients presenting with early-stage disease can often avoid surgery if recognized early and treated with appropriate medical therapy. Furthermore, as the disease progresses to a more advanced stage, morbidity will significantly increase.

**Treatment**

Regardless of the ultimate treatment plan, broad-spectrum antibiotics should be initiated immediately after the initial evaluation. If culture and sensitivity data become available, the regimen may be tailored accordingly. However, a broad-spectrum approach should be used even with a positive culture result given the possibility of a multibacterial process and lack of sensitivity of cultures, particularly for anaerobes. The organisms that need to be covered include both the typical pathogens in sinusitis as well as organisms often not encountered in sinus infections. In several larger studies of orbital infections secondary to sinusitis, Staphylococcus and Streptococcus species were most commonly isolated [1, 25]. Methicillin-resistant Staphylococcus